KS12 Modem User Guide

The KS12 Modem software is a 1200 BPS AFSK modem that runs on the TAPR/AMSAT DSP-93 hardware platform.

Features:

- Bell 202 1200 Baud AFSK tone detection and generation.
- Performs HDLC Frame assembly and disassembly.
- Implements open squelch carrier detection.
- Communication with modem uses KISS protocol over the DSP-93 UART link.

DSP-93 Front Panel LED Usage:

LED1 is DSP-93 Monitor Active
LED2 is Transmitter ON
LED3 is Transmit Pending
LED4 is Not Receiver carrier detect
LED5 is Packet Received
LED6 is Receiver Input Level Indicator
LED7 is Receiver carrier detect
LED8 is power

Radio Port Setup

The KS12 modem can use either radio port. It defaults to radio port 1. Please follow the instructions carefully for attaching radios to the DSP-93 using the procedures called out in the DSP-93 Operations Manual. ***Pay particular attention to the pin strapping of the TNC connector for selecting the proper PTT polarity***. Failure to do so could turn on your transmitter unexpectedly. It might be a good idea to disable your transmitter PTT or use a dummy load until you have checked out all the connections and signals from the DSP-93.

Loading KS12 Software

The KS12 modem software must first be loaded into the DSP-93 using the normal dspload.exe program from DOS or the D93WE program from within Windows. Refer to the DSP-93 Operations Manual for a thorough description of file loading and configuration.

First reset the DSP-93 box so that LED1 and LED8 are on. This places the unit in the monitor mode and allows program loading.

If in DOS make sure the proper com port is selected in the DSPLOAD.CFG file then Type→ DSPLOAD KS12MAIN.

If using D93WE in Windows, select the KS12MAIN.OBJ file for downloading.

LED1 should briefly flicker and then the file download begins. The download process will take 10 seconds or more. When the downloading is complete, all 8 LED's will light briefly then only LED4 and LED8 will remain on.

Setting Receiver Audio Level

With the radio squelch open without any incoming signal except for the receiver noise, adjust either the volume control if you are using the speaker output, and/or R215/R213(port1/port2) inside the DSP-93 until LED6 just flickers every few seconds. If it is mostly on, reduce the input signal. If it never blinks, increase the signal until it just begins to flash every few seconds. If incoming signal is out of range of the pots then there is a way to increase or decrease the overall gain of the DSP-93 using either the "Hardware" command described later or by changing the default gain of the program and re-assembling.

When a packet signal is being received, LED4 should go off and LED7 should turn on. This is the carrier detect signal. It may periodically blink even when no signal or a weak signal is present.

If a complete packet is correctly received without errors, then LED5 will blink briefly as the data is squirted back out the DSP-93 serial UART link using KISS protocol format.

Setting Up The Host Computer

In order to set the transmit audio level, a KISS formatted packet must be sent to the DSP-93 over the serial link from the host computer. This requires the use of KA9Q's NOS (Network Operating System) or one of its derivatives such as JNOS, in order to properly send and receive formatted Amateur radio packets that contain your callsign and all the other control information that is normally done provided by a TNC.

Those unfamiliar with these programs should refer to “NOSintro TCP/IP Over Packet Radio” by Ian Wade G3NRW or some other guide to using the NOS software. Many of these programs can be found on the TAPR web site at http://www.tapr.org.

The NOS programs use a file called “autoexec.nos” to setup various parameters. One parameter is the “attach” command for setting the serial port for the proper baud rate, com port, and protocol type. The KS12 modem defaults to 9600 bps, 8 bits, no parity, one stop bit. If other baud rates are required, then the program can be easily recompiled to suite your needs by changing define statement for BAUDRATE in the file KS12MAIN.ASM.

Example “attach” statements for the autoexec.nos setup file:
for COM1:
attach asy 3f8 4 ax25 ax0 2048 256 9600
for COM2:
attach asy 2f8 3 ax25 ax0 2048 256 9600

Other parameters that should be setup are some timer settings and whether the modem is to run full or half duplex.(half duplex should always be selected for simplex packet radio otherwise the modem will not wait for a clear channel and will stomp on anyone else who may be transmitting) The “param” command in the “autoexec.nos” file is used to initialize these modem parameters.

Interface parameters supported by the KS12 software modem:

Syntax: param <iface> <number|name> <value>

Number	Name	
1	- TxDelay	see NOS or KISS spec for documentation
2	- Persist	see NOS or KISS spec for documentation
3	- SlotTime	see NOS or KISS spec for documentation
4	- TxTail	see NOS or KISS spec for documentation
5	- FullDup	1=FULL ***0=HALF (default)***
6	- Hardware	see description below

#example settings----(also the default in the KS12 modem)
param ax0 TxDelay 50
param ax0 Persist 63
param ax0 SlotTime 10
param ax0 TxTail 5
param ax0 FullDup 0
param ax0 Hardware 16

The “Hardware” parameter is unique to the KS12 modem and can be used to select which DSP-93 radio port to use and also can select the DSP-93 receive signal gain factor. Below is a table of valid values and their meaning for the “Hardware” parameter.

Bit 7 selects radio port1 or 2. (default is port1, Bit7=0)
Bits 5-0 select the Receive gain.

param DEC	param HEX	Radio Port	Receiver Gain
0	00h	1	Gain = 1
8	08h	1	Gain = 2
16	***10h***	***1***	***Gain = 4***
24	18h	1	Gain = 8
32	20h	1	Gain = 16
40	28h	1	Gain = 32
48	30h	1	Gain = 64
128	80h	2	Gain = 1
136	88h	2	Gain = 2
144	90h	2	Gain = 4
152	98h	2	Gain = 8
160	A0h	2	Gain = 16
168	A8h	2	Gain = 32
176	B0h	2	Gain = 64

Default settings are Radio Port1 with a GAIN=4.

Setting Up Transmitter Audio Level

An easy way to transmit a test packet is to use the beacon broadcast command in NOS. This can be accomplished by enabling the following commands in the autoexec.nos file:

```
ax25 bcport ax0
#This sends the bctext message every 5 seconds
ax25 bcinterval 5
ax25 bctext "This is a Test Packet from AE4JY"
```

Be sure you have setup your callsign properly according to the normal NOS documentation and also remember to remove these commands (or change the interval) after everything has been setup.

Start the setup with the adjustment pot R14/R13 (Port1/Port2) at minimum setting by turning counterclockwise several turns. Monitor the transmitter with another receiver and adjust R14/R13 (Port1/Port2) clockwise to increase the modulation until the signal in the second receiver is about as loud as other strong packet signals on the air or to the point where the received signal just starts to stop increasing in volume.

Known Problems

- The modem is not particularly sensitive. The decoder uses a simple delay line discriminator and edge detection for clock recovery and carrier detection so is not very optimum. Future plans are for a more sophisticated data recovery scheme.

- There is no watchdog timer in the DSP-93 to prevent a stuck PTT signal which could occur if the program got lost due to power fluctuations, RF interference, code instabilities [quite likely :>)] or other random occurrences in the universe. It has not happened during testing, but one should be careful with long unattended operation.

- Using a 19200 BAUD rate for the KISS interface has not been tested on a lot of computers especially running Windoze. The modem should handle it but there are many PC's which have problems at rates above 9600.(like my old 386 machine)

Moe Wheatley , AE4JY , 1996